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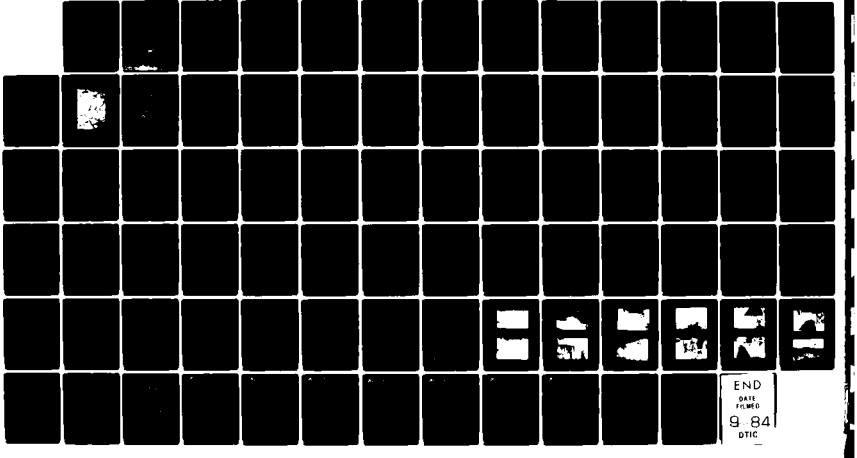

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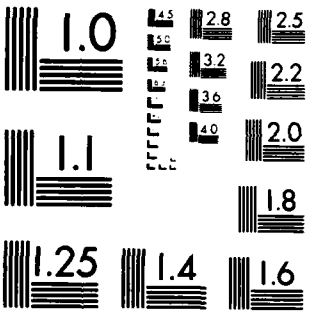

CONNECTICUT RIVER BASIN
VERNON, CONNECTICUT

(1)

PAPER MILL POND DAM
CT 00621

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION REPORT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Vernon, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Paper Mill Pond consists of a 17 foot long concrete spillway and a 15 foot long concrete dam. It is classified as SMALL in size with a hazard classification of HIGH. The dam is in fair condition with some seepage from the face of dam and some deterioraged concrete. Because the dam is at the low end of the range for the size classification, a test flood of ½ PMF was used.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

SEP 11 198

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Paper Mill Pond Dam (CT-00621) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, Amerbelle Corporation, Rockville, CT. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

CONNECTICUT RIVER BASIN

VERNON, CONNECTICUT

PAPER MILL POND DAM

CT 00621

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

Phase I Inspection Report

Identification No:	CT 00621
Name of Dam:	Paper Mill Pond Dam
Town:	Vernon
County & State:	Tolland, Connecticut
Stream:	Hockanum River
Date of Inspection:	March 10, 1981

BRIEF ASSESSMENT

Paper Mill Pond consists of a 17 foot long concrete spillway and a 15 foot long concrete dam, all completely surrounded by buildings of Amerbelle Corporation. At top of dam elevation, the dam impounds 90 acre-feet. Outlet works consist of a drawdown conduit of unknown size and twin 8-inch lines for process water. Under normal conditions, the entire flow of the Hockanum River discharges over the spillway. This dam has a maximum height of 16.7 feet with the top of dam 5.5 feet above the spillway crest. There are no available records to indicate when construction of the dam took place but indications are that it was in the early 1900's. The dam is presently used to supply process water. Originally, it was also used for the generation of electricity.

Paper Mill Pond is classified as SMALL in size with a hazard classification of HIGH. The dam is in fair condition with some seepage from the face of dam and some deteriorated concrete. In addition to the operable outlet works, there is the 48-inch metal penstock that was originally used to supply water to the generator turbine. This outlet is plugged and the pipe partially filled and collapsed.

The inlet channel from the impoundment starts at an arch under Route 31 and continues under a mill building, a local street and another building to the dam. Ledge forms the bottom of the outlet channel which passes under a building and plunges down a steep slope directly into the pool of the Hockanum River Dam, CT 00620. The relationship between the dam and buildings is shown on the Photo Index Plans in Appendix C.

Corps of Engineers Guidelines recommend a test flood of from half PMF to the PMF. Because the dam is at the low end of the range for the size classification, a test flood of half (½) PMF was used. A peak flow of 5,100 cfs was calculated for this test flood. Because of the relatively small size of the impoundment, surcharge storage only reduces the outflow to 5,000 cfs.

It is recommended that the owner engage the services of qualified registered engineer to accomplish the following: inspect the approach channel, spillway and discharge channel and perform a detailed hydrologic-hydraulic investigation to determine discharge capacities

and assess the potential of overtopping the dam along with the need to increase project capacity; investigate seepage and deteriorated concrete on the downstream face of dam; investigate and determine adequacy of plugging the collapsed penstock; investigate the need to reconstruct the concrete portion of the south abutment.

In addition, the owner should institute a regular maintenance program; establish a program of annual technical inspections; and develop an Emergency Action Plan.

Recommendations and remedial measures listed above and detailed in Section 7 should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

FUSS & O'NEILL, INC.

By _____
Walter S. Fuss, P.E.
President

This Phase I Inspection Report on Paper Mill Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition

of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest resonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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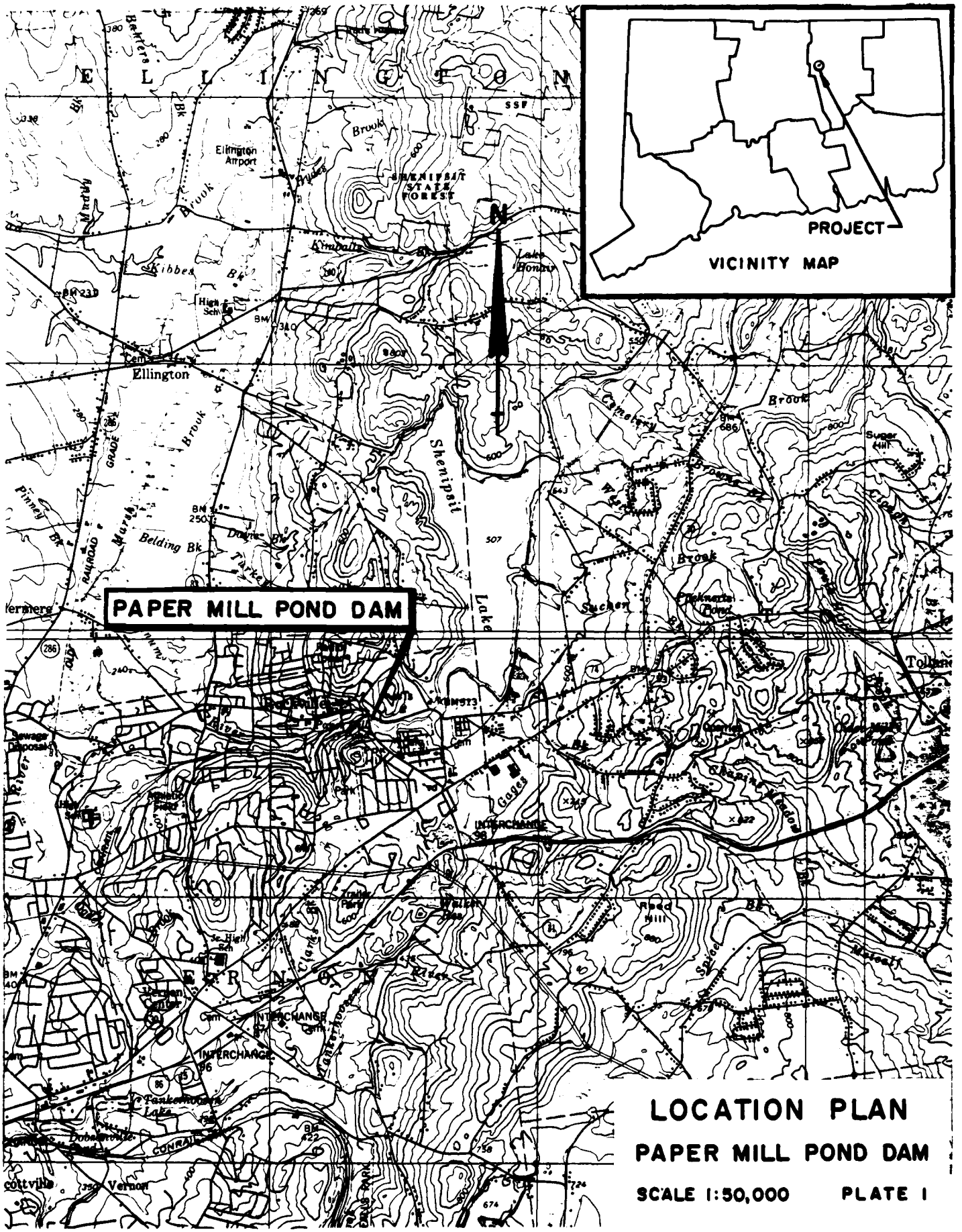
OVERVIEW PHOTO



LOCATION PLAN

PAPER MILL POND DAM

SCALE 1:50,000 PLATE 1

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
PAPER MILL POND DAM CT 00621

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England region. Fuss & O'Neill, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Fuss & O'Neill, Inc. under a letter of 25 November, 1980 from William E. Hodgson, Jr., Colonel of Engineers. Contract No. DACW33-81-C-0020 has been assigned by the Corps of Engineers for this work.

b. Purpose.

1. Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2. Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3. To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT:

a. Location. Paper Mill Pond Dam is located in the Rockville section of the Town of Vernon, County of Tolland. The dam is located at latitude 41°-52.0' and longitude 72°-26.5' and impounds the flow in the Hockanum River. Approximately 16 miles downstream, the Hockanum River joins the Connecticut River in the Town of East Hartford. Paper Mill Pond has a total watershed area of 16.5 square miles including 440 acre Shenipsit Lake (CT 00209). The dam is entirely surrounded by a building owned by Amerbelle Corporation south of East Main Street (Connecticut Route 74) just west of its intersection with Connecticut Route 31. The impoundment runs easterly along the south side of East Main Street. See Photo Index Plans in Appendix C for location of dam.

b. Description of Dam and Appurtenances. Paper Mill Pond dam is 32 feet long including a 17 foot long spillway. Both the dam and spillway are concrete with the upstream slopes unknown. On the downstream side, the dam is vertical and the spillway has a batter of about 1.6 horizontal to 1.0 vertical. The top of the dam is 3

feet thick. Stone and concrete building foundations form the abutments at each end of the dam.

A 48 inch diameter metal penstock leads from the dam to what was originally a turbine room for the generation of electricity. Although the controls are still in place and have been recently painted, they are inoperative. The penstock is partially filled and collapsed with the generating equipment removed. The method of plugging the penstock is unknown.

Controls on the crest of the dam operate a drawdown outlet, the size of which is unknown. This control is reported to be operated infrequently and can lower the water level in Paper Mill Pond only during periods of low flow in the Hockanum River. The control is the right hand wheel on the platform shown in Photo C-5.

There are also twin 8-inch pipes used to draw process water from the impoundment. The controls for these pipes are located within the mill complex.

Both the approach channel to the spillway and the downstream channel run through Amerbelle Corporation buildings. These channels appear to be of stone and concrete.

c. Size Classification. Paper Mill Pond Dam has a height of 16.7 feet from the crest of dam to bed of stream at the spillway. There

is a total storage volume of 90-acre-feet at top of dam level. The dam is therefore classified as a SMALL structure in accordance with the recommended guidelines of the Corps of Engineers which defines a small dam as one with a storage capacity of 50 to 1000 acre feet or a height of 25 or more but less than 40 feet.

d. Hazard Classification: This dam is classified as having a HIGH hazard potential because a failure could cause more than a few losses of life. An apartment building located 2900 feet downstream with units partially below ground would have no flooding before failure and would have water depths 1.2 feet above ground at the building after failure. This would result in water depths of about 4.2 feet in several apartments. Upstream of this apartment building, the flow from the assumed breach discharge of 2,000 cfs would be contained within the channel.

e. Ownership. Paper Mill Pond is owned by:

Amerbelle Corporation
104 East Main Street
Rockville, CT 06066

f. Operator. The operator of the dam is Mr. Lawrence Passardi of Plant Maintenace under the direction of Mr. Irving Horowitz, Sr. Vice-President of Amerbelle Corporation, Telephone (203) 875-3325.

g. Purpose of Dam. When the dam was originally constructed, it had the dual purpose of operating turbines to generate electricity and supplying process water for the mill complex. It is no longer used for generating electricity.

h. Design and Construction History. No records are available regarding the history of the design and construction of Paper Mill Pond. Indications are that the dam was constructed in the early 1900's.

i. Normal Operating Procedures. There are no written operating records available. The process water is drawn as required for the manufacturing process.

1.3 PERTINENT DATA:

a. Drainage Area. The drainage area is 16.5 square miles of rolling uplands, mostly rural and generally wooded. Almost the entire watershed discharges through Shenipsit Lake located 3200 feet upstream from the dam.

b. Discharge to Dam Site. There is no history of discharge data available for this dam. Listed below are calculated discharge data for the ungated spillway. Discharge records for the process

water are not available but are insignificant. The size and type of drawdown conduit is unknown.

1.	Outlet Works	
	a. Process Water	Insignificant
	b. Drawdown Outlet	Unknown
2.	Maximum known flood Sept. 1938 at Shenipsit Lake	1500 cfs.
3.	Ungated spillway capacity Top of dam elev. 479.5	700 cfs.
4.	Ungated spillway capacity Test flood elevation 489.8	5000 cfs.
5.	Gated spillway capacity Normal poll elevation	N/A
6.	Gated spillway capacity Test flood elevation	N/A
7.	Total spillway capacity Test Flood elevation 489.8	5000 cfs.
8.	Total project discharge Top of dam elevation 479.5	700 cfs.
9.	Total project discharge Test flood elevation 489.8	5000 cfs.

It should be noted that it was assumed the entire Test Flood Discharge would reach the dam.

c. Elevation. (feet above NGVD)

1.	Streambed at toe of dam	462.8
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	Unknown
4.	Normal pool	474.0
5.	Full flood control pool	N/A
6.	Spillway crest	474.0
7.	Design surcharge	Unknown
8.	Top of dam	479.5
9.	Test flood surcharge	489.8

d. Reservoir. (Length in feet)

1.	Normal pool	2500'
2.	Flood control pool	N/A
3.	Spillway crest pool	2500'
4.	Top of dam	2800'
5.	Test flood pool	3100'

e. Storage. (Acre-Feet)

1.	Normal Pool	40
2.	Flood control pool	N/A
3.	Spillway crest pool	40
4.	Top of Dam	90
5.	Test flood pool	198

f. Reservoir Surface. (acres)

1.	Normal pool	8
2.	Flood control pool	N/A
3.	Spillway crest	8
4.	Test flood pool	12
5.	Top of dam	10

g. Dam.

1.	Type	Concrete
2.	Length	32'
3.	Height	16.7'
4.	Top width	3'
5.	Side slope	N/A
6.	Zoning	N/A
7.	Impervious Core	N/A
8.	Cutoff	Unknown
9.	Grout curtains	Unknown

h.	Diversion and Regulating Tunnel.	N/A
i.	Spillway.	
	1. Type	Concrete weir
	2. Length	17'
	3. Crest elevation	474.0
	4. Gates	None
	5. U/S Channel	Natural bed
	6. D/S Channel	Natural bed (ledge)
j.	Regulating Outlets.	
	Drawdown Outlet	
	1. Invert	Unknown
	2. Size	Unknown
	3. Description	Unknown
	4. Control mechanism	Hand wheel at top of dam
	5. Other	Only effective during low flow
	Process Water	
	1. Invert	Unknown
	2. Size	2 @ 8"
	3. Description	Metal pipe
	4. Control mechanism	Valves at filter tank
	5. Other	Flow insignificant

SECTION 2 - ENGINEERING DATA

2.1 DESIGN:

No design data is available for this dam.

2.2 CONSTRUCTION:

No record of construction is available for this dam.

2.3 OPERATION:

No operating records are available for this dam.

2.4 EVALUATION:

a. Availability. Because of the age of this dam, design and construction information are not available.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of the dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgment.

c. Validity. The validity of the limited data must be verified.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS:

a. General. Based on visual inspection, Paper Mill Pond Dam appears to be in fair condition. The dam is presently being used to impound process water for Amerbelle Corporation. In the past, it was also used to run turbines to generate electricity. Concrete was used for the construction of the dam and spillway. An area about 32 feet by 48 feet, completely surrounded by building, encloses the dam and controls with an approach channel and discharge channel. Both abutments are formed by the walls of the building which consist of stone and concrete.

b. Concrete. The dam is of concrete and is three feet thick at the top with a vertical downstream face. Although the upstream face is not visible, it appears to also be vertical or nearly so. Based on nearby outcroppings, it is likely that the dam is founded on ledge.

1. Upstream Face - The portion of the upstream face that is visible appears to be in good condition. Attached to the upstream face is the control mechanism for the drawdown outlet as shown in Photo C-8. This face should be inspected with the water level lowered.

2. Crest - Concrete on the crest is in fair condition with some minor scaling which does not appear to be a problem at this time.

3. Downstream Face - The downstream face including the abutment for the spillway, as shown in Photo C-5 is in poor condition. There is some efflorescence and severe scaling along the lower two feet of wall as shown in Photos C-5 and C-6. Photo C-6 also shows seepage along the line between the good concrete and the scaled concrete. Because of the sharp line of demarcation between the good and poor concrete, it would appear two batches of concrete are involved. There does not seem to be any leakage around or through the abandoned penstock as shown in Photo C-7. The scaled area appears to be a surface defect, but this should be investigated further along with the cause of the seepage which appears to be along a cold joint. Fill downstream of the dam appears to be stable with some grass.

c. Appurtenant Structures.

1. Spillway - the spillway is 17 feet long and is made of concrete. Because of the flow, the condition could not be inspected, an inspection should be made when the impoundment is drawn down to expose both faces. Photo C-4 shows the downstream face

of the spillway and Photo C-9 shows the upstream side of the spillway. Except for some efflorescence on the north side, the north abutment of the spillway appears to be in good condition. The south abutment consists of the stone foundation of the building with a section of concrete wall cast on the face as shown in Photo C-10. The visual inspection indicates that the concrete is a facing and does not affect the stability of the dam. Exposed portions of the stone foundation are in fair condition while the concrete facing is in poor condition. There are cracks and badly scaled areas and the lower portion of the wall appears to have broken away. Although the deteriorated concrete does not appear to pose an immediate threat to the structural stability of the dam, it should be investigated further and any required repairs completed. From the visual inspection, the spillway appears to be founded on ledge. Methods of anchoring the spillway to the ledge are not apparent.

2. Drawdown Outlet - The owner does not know the size or type of drawdown outlet and it can not be seen with flow over the spillway. This outlet is rarely used and is not regularly tested for operation. All visible controls have been recently painted as shown in Photo C-8 and C-11. When last used, it was operable.

3. Process Water Outlet - This outlet can not be seen and the only information available is that it consists of twin 8 inch pipes. Controls are within the mill complex near the filters used to cleanse the water. There are no reported problems with this system.

4. Penstock - One of the original uses of the dam was generation of electricity with a 48 inch penstock running from the base of the dam to the turbine room downstream of the dam. All generating equipment has been removed and the penstock is partially collapsed and partially filled as shown in Photo C-7. The original controls are still in place and can be seen in Photo C-5 to the left of the dam crest. These controls no longer are connected to an operating gate. The method of plugging the upstream end of the penstock is unknown, but should be investigated to insure that the plug is functioning properly.

d. Reservoir Area.

The channel leading from the reservoir to the dam runs under two buildings and a narrow street between the building. This channel can not be inspected except with the impoundment lowered and under low flow conditions. At the upstream end of the building, the

channel passes under Route 31 in an arch culvert as shown in Photo C-3. This culvert appears to be in good condition. Photo C-2 shows the roadway over the channel. When storm flows exceed the capacity of the channel, excess flow runs northerly along Route 31 to Route 74 (East Main Street) and then westerly on Route 74 to rejoin the river downstream. No detrimental features in the reservoir area were observed during the visual inspection. Slopes are well covered with growth and appear to be stable. Photo C-1 shows the pond upstream of the dam.

e. Downstream Channel. The downstream channel from the dam to the pool at Hockanum River Dam (CT 00620) is on exposed ledge. Photo C-11 shows the channel from the spillway to where it enters the building through a stone arch. In Photo C-12, the channel is shown from where it leaves the building to the pool below. The portion of the channel walls that are visible are in fair condition with no apparent loose stone or deteriorated concrete.

3.2 EVALUATION:

Based on the visual inspection, the overall condition of Paper Mill Pond Dam is fair but with several areas that require attention.

During a period of low flow, the water level in the impoundment should be lowered and the spillway, upstream face of dam, approach channel and discharge channel should be inspected and a detailed hydrologic-

hydraulic investigation performed to determine capacities of channels and the spillway. Also, assess the potential of overtopping the dam and the need for and means to increase the project discharge capacity.

The seepage from the face of dam should be investigated and any required repairs made.

Deteriorated and cracked concrete at the south abutment should be repaired.

Adequacy of the plug in the penstock should be checked.

Determine the size and operability of the outlet mechanism.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES:

a. General. The full flow of the Hockanum River passes over the spillway of Paper Mill Pond. Process water is drawn from above the dam through two 8 inch pipes by gravity. This flow is insignificant compared to the flow in the river and the size of the impoundment. The drawdown outlet is rarely used.

b. Description of Any Warning System in Effect. There is no formal downstream warning system in case of emergency at the dam.

4.2 MAINTENANCE PROCEDURES:

a. General. Minor maintenance is performed as required with no specific schedule. Major maintenance is lacking.

b. Operating Facilities. Operational checks of the drawdown outlet are not routinely made. The process water outlet is used daily. Debris is removed as required.

4.3 EVALUATION:

A regular maintenance plan should be developed for operation of outlets, debris removal and minor repairs and an annual technical inspection instituted.

A downstream warning system should be developed and put into effect in case of emergency at this dam.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL:

Paper Mill Pond is a 32 foot long concrete dam including a 17 foot spillway section. The maximum head at the spillway is 5.5 feet before the dam is overtopped.

The impoundment size at normal stage is approximately 8 acres with estimated storage volume of 40 acre-feet.

The watershed area is 16.5 square miles of rolling uplands, mostly rural and generally wooded except for the area immediately around the dam which is urban. About 98 percent of this watershed area discharges through the 440 acre Shenipsit Reservoir located 3200 feet upstream of Paper Mill Pond.

5.2 DESIGN DATA:

No specific data is available for this watershed or the structure at Paper Mill Pond. In lieu of existing design information, U.S.G.S. Topographic Maps were utilized to develop hydrologic parameters. Some of the pertinent hydraulic design data was obtained by actual field measurements at the time of the field inspection.

Also used was information developed for the Phase I Inspection Report for Hockanum River Dam (CT 00620) dated May 1980. This dam is located approximately 300 feet downstream of Paper Mill Pond.

5.3 EXPERIENCE DATA:

No records are available in regard to past operation of the impoundment or of surcharge encroachments and outflows through the spillway or outlet. The maximum past inflows are unknown at this dam. The U.S.G.S. reports a peak flow at Shenipsit Lake of 1500 cfs. in September 1938. It is reported by residents that part of the flow during this storm bypassed the dam and flowed along adjacent streets.

5.4 TEST FLOOD ANALYSIS:

Corps of Engineers guidelines were used as the basis for the Test Flood for determining the spillway adequacy. The size classification of the dam is SMALL based upon a height of 16.7 feet and a storage volume of 90 acre-feet. The hazard potential is HIGH because of the possibility of the loss of more than a few lives in the event of a dam failure. The test flood in the Corps of Engineers guidelines for this size dam and hazard potential ranges from the half (½) PMF to the PMF. The recommended spillway test flood is the half (½) PMF because the dam is at the low end of the range for the size classification.

Because of the very large percentage of the Hockanum River flow that passes through Shenipsit Lake, the test flood is strongly influenced by the lake. This influence was evaluated by routing the test flood through the Shenipsit Lake Dam structure to determine its outflow rate. The Phase I Report for Hockanum River Dam used stage-discharge and reservoir area data that was developed in the Phase I Report for Shenipsit Lake Dam dated September 1978.

The inflow used to evaluate the Paper Mill Pond Dam was set equal to 104 percent of the Shenipsit Lake Dam outflow. The added 4 percent is to approximate the runoff from the additional watershed area tributary to the river between the two dams. This resulted in a peak inflow rate of 5,100 cfs at Paper Mill Pond.

Because of the relatively small storage volume available in comparison to the flow, the effect of surcharge storage is small, resulting in a Test Flood peak flow of 5000 cfs. at the dam. The peak test flood stage at the dam would be elevation 489.8 which is 10.3 feet above the dam. Spillway capacity at top of dam elevation (479.5) is 700 cfs. which is 14 percent of the peak test flood outflow.

It is recognized that part of the flow would be blocked by the Route 31 culvert and the approach channel under the building as well as the downstream channel. Photo C-4 shows the downstream end of

the approach channel under the buildings. As shown in the photo, a large air duct partially blocks the channel under the building. Due to a curtain hanging in the channel, it is not possible to observe the size, configuration or condition of the channel under the two buildings and the street between them. This curtain is used to reduce wind currents under the building. In order to determine the capacity of the approach channel, it would be necessary to enter the channel with the pond lowered during a period of low flow.

When flows through Paper Mill Pond exceed the capacity of the channel, the excess water will flow north on Route 31 (Photo C-2) to East Main Street and then west to a shopping plaza about 1400 from Route 31. Just west of the shopping plaza, the flow can rejoin the Hockanum River.

5.5 DAM FAILURE ANALYSIS:

The downstream impact of dam failure was analyzed using the Corps of Engineers "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", dated April 1978 as used in the National Dam Inspection Program.

The peak outflow is calculated by combining the dam failure outflow and the pre-failure discharge. Water surface elevations are calculated for both the pre-failure and post-failure conditions at selected stations

downstream of the dam. These calculations are included in Appendix D.

It was assumed that the entire 17 foot spillway would be breached. This resulted in a flood flow of 2000 cfs. The pre-failure flow is 700 cfs. It was assumed that the failure would take place with the pond at top of dam elevation (elevation 479.5).

Because of the steep slope of the channel, (See Photos C-11 and C-12) it is assumed that the flow will pass to and over the Hockanum River Dam (CT 00620) without causing any damage. Below this dam the river flows under an office building, two banks and a shopping plaza in a 14 foot wide by 10 foot high concrete box culvert. This culvert has an average slope of about 3.7 percent and the depth of flow would be 4 feet.

About 1800 feet downstream of Paper Mill Pond, the Hockanum River is in a natural channel with steep sides and an average slope of about 3 percent. The pre-failure stage would be elevation 343.0 or a depth of 3.0 feet. The post-failure stage would be 345.5 or a depth of 5.5 feet. Both flows would be contained within the banks of the river and would cause no damage.

About 2900 feet downstream of the dam, the slope of the river bed flattens out to about 1.7%. At this point, the pre-failure stage would be elevation 291.3 or a depth of 4.3 feet and the post-failure stage would be 294.5 with a depth of 7.5 feet. The pre-failure flow would be contained within the banks of the river. The post-failure flow would result in approximately 1.2 feet of water at the base of a large apartment building about 25 feet from the banks of the river. This building, located 2900 feet downstream of the dam, was converted from an old mill building and several apartments on the lower level have floors about 3 feet below ground level. There are several windows and a doorway with a handicap ramp in the area that would be flooded by the assumed breach. Therefore, the 1.2 foot depth of water outside of the building would translate to 4.2 feet of water inside of the apartments.

Since the hazard classification is established as HIGH at this point, the dam failure hydrograph was not routed beyond this point.

SECTION 6 - STRUCTURAL STABILITY

6.1 VISUAL OBSERVATION:

The field inspection did not reveal any stability problems. However, the deteriorated portion of concrete at the south abutment should be investigated to insure that it does not affect stability.

6.2 DESIGN AND CONSTRUCTION DATA:

There is no design or construction data available to permit a formal evaluation of the stability of the dam. Thus, the evaluation of stability is based soley on the visual inspection.

6.3 POST CONSTRUCTION CHANGES:

There are no post construction changes apparent.

6.4 SEISMIC STABILITY:

Paper Mill Pond Dam is located in Seismic Zone 1 and in accordance with Corps of Engineers guidelines does not warrant further seismic analysis at this time.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

a. Condition. Based on a visual inspection, the dam appears to be in fair condition. There are some features which could affect the long-term performance of the dam if they are not corrected as recommended in Sections 7.2 and 7.3.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, past operational performance of the structure, and sound engineering judgment.

c. Urgency. The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be carried out within one year of receipt of this report by the Owner.

7.2 RECOMMENDATIONS:

It is recommended that the Owner employ a qualified registered engineer to:

a. With water levels lowered, inspect the outlet conduit, approach channel, spillway and discharge channel; perform a detailed

hydrologic-hydraulic investigation to determine the discharge capacity of the approach channel, spillway and downstream channel during major floods; assess the potential of overtopping the dam and need for and the means to increase the project discharge capacity.

b. Investigate the seepage and deteriorated concrete on the downstream face of the dam and design remedial measures.

c. Investigate and determine the adequacy of plugging of the unused and collapsed penstock to insure that there will not be leakage.

d. Investigate the need for reconstruction of the concrete portion of the south abutment.

7.3 REMEDIAL MEASURES:

a. Establish a regular schedule of maintenance including valve operation.

b. Institute a program of annual technical inspections by a qualified registered engineer.

c. Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, location of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation and will also include monitoring of the project during flood periods.

7.4 ALTERNATIVES:

There are no practical alternatives to the recommendations of Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Paper Mill Pond DATE 3/10/81

TIME 9:30

WEATHER Cloudy 35°

W.S.Elev. 474.4 U.S. 463 DN.S.

PARTY:

1. G. Mirtl, Hydroglogy & Hydraulics
2. C. Welti, Soils & Geology
3. E. Lang, Structural & Mechanical
4. L. Passardi, Owner Chief of Maintenance
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

PROJECT FEATURE	INSPECTED BY	REMARKS
1. All features inspected by all members of the party.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	No Embankment - Concrete Dam
Crest Elevation	479.5
Current Pool Elevation	474.0
Maximum Impoundment to Date	Unknown
Surface Cracks	N/A
Pavement Condition	None
Movement or Settlement of Crest	N/A
Lateral Movement	N/A
Vertical Alignment	N/A
Horizontal Alignment	N/A
Condition at Abutment and at Concrete Structures	Fair
Indications of Movement of Structural Items on Slopes	None

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT (cont)	
Trespassing on Slopes	N/A
Sloughing or Erosion of Slopes or Abutments	N/A
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	N/A
Unusual Embankment or Downstream Seepage	Some seepage through concrete
Piping or Boils	N/A
Foundation Drainage Features	N/A
Toe Drains	N/A
Instrumentation System	None
Vegetation	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Concrete walls
Bottom Conditions	Unknown
Rock Slides or Falls	None
Log Boom	None
Debris	Minor
Condition of Concrete Lining	Fair where visible
Drains or Weep Holes	None apparent
b. Intake Structure	
Condition of Concrete	Fair
Stop Logs and Slots	None

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	N/A
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	Open Platform
a. Concrete and Structural	
General Condition	Good
Condition of Joints	Good
Spalling	None
Visible Reinforcing	None
Rusting or Staining of Concrete	None
Any Seepage or Efflorescence	None observed
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	None observed
Rusting or Corrosion of Steel	None

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER (cont)	
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	None
Elevator	None
Hydraulic System	None
Service Gates	None
Emergency Gates	None
Lightning Protection System	None
Emergency Power System	None
Wiring and Lighting System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	N/A - Pipe direct from gates
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Not visible but indications that it is bedrock.
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust of Staining	None observed
Spalling	Some
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Some

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
b. Weir and Training Walls	
Drain Holes	None observed
c. Discharge Channel	
General Condition	Concrete - Poor Stone - Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Bedrock
Other Obstructions	None

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	None
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	

PERIODIC INSPECTION CHECK LIST

PROJECT Paper Mill Pond DATE 3/10/81

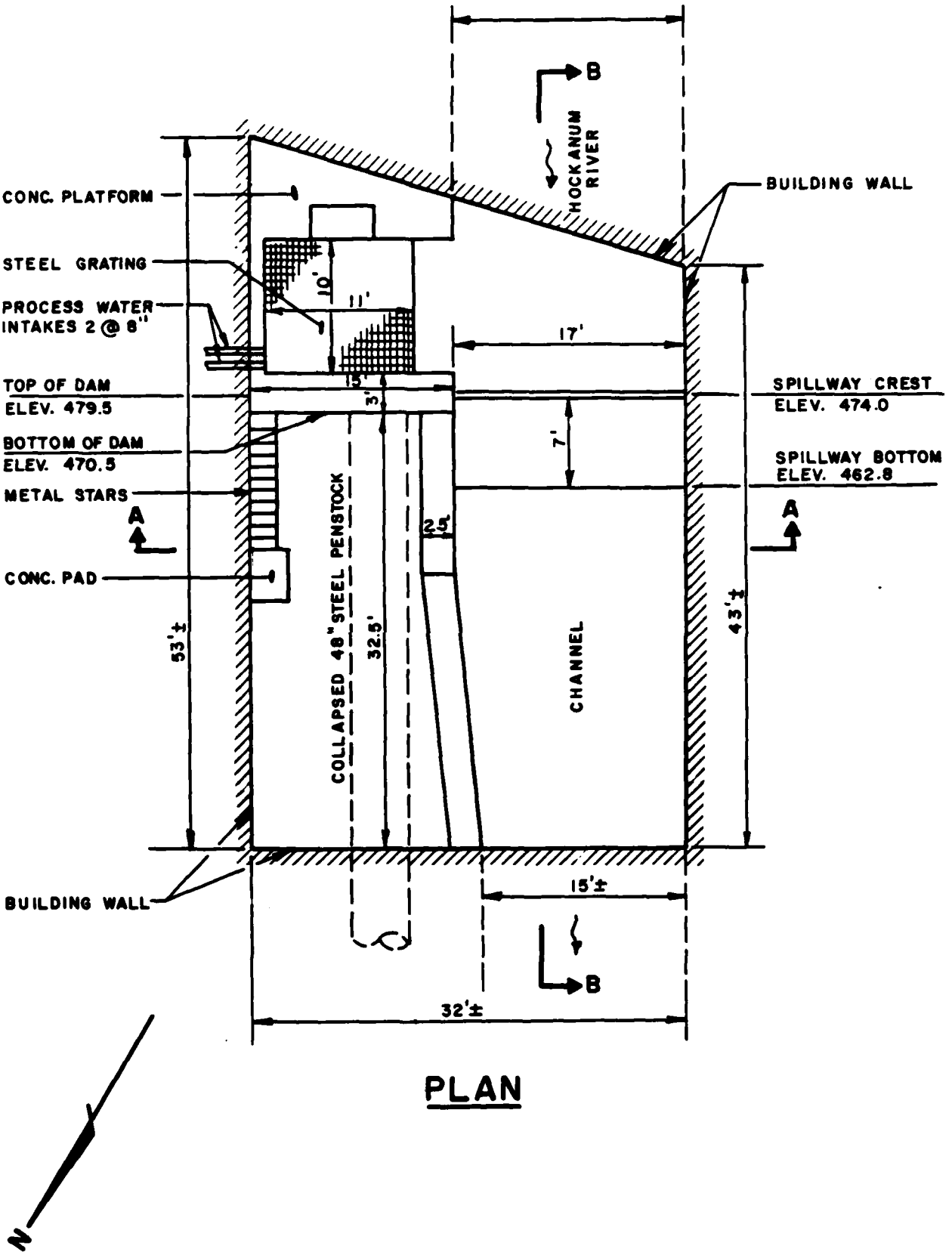
PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE (cont)	None
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

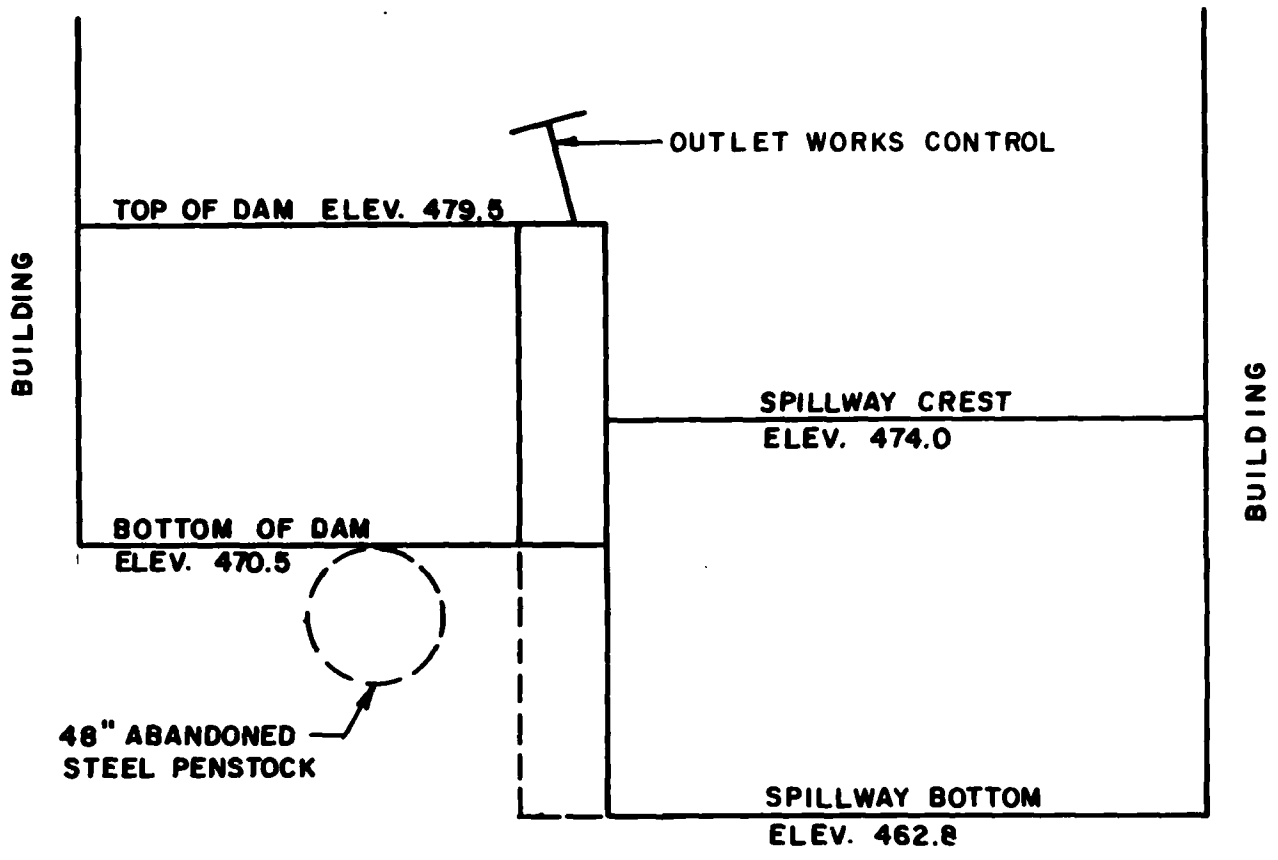
ENGINEERING DATA



PLAN

PAPER MILL POND DAM

SCALE: 1"= 10' PLATE B-1

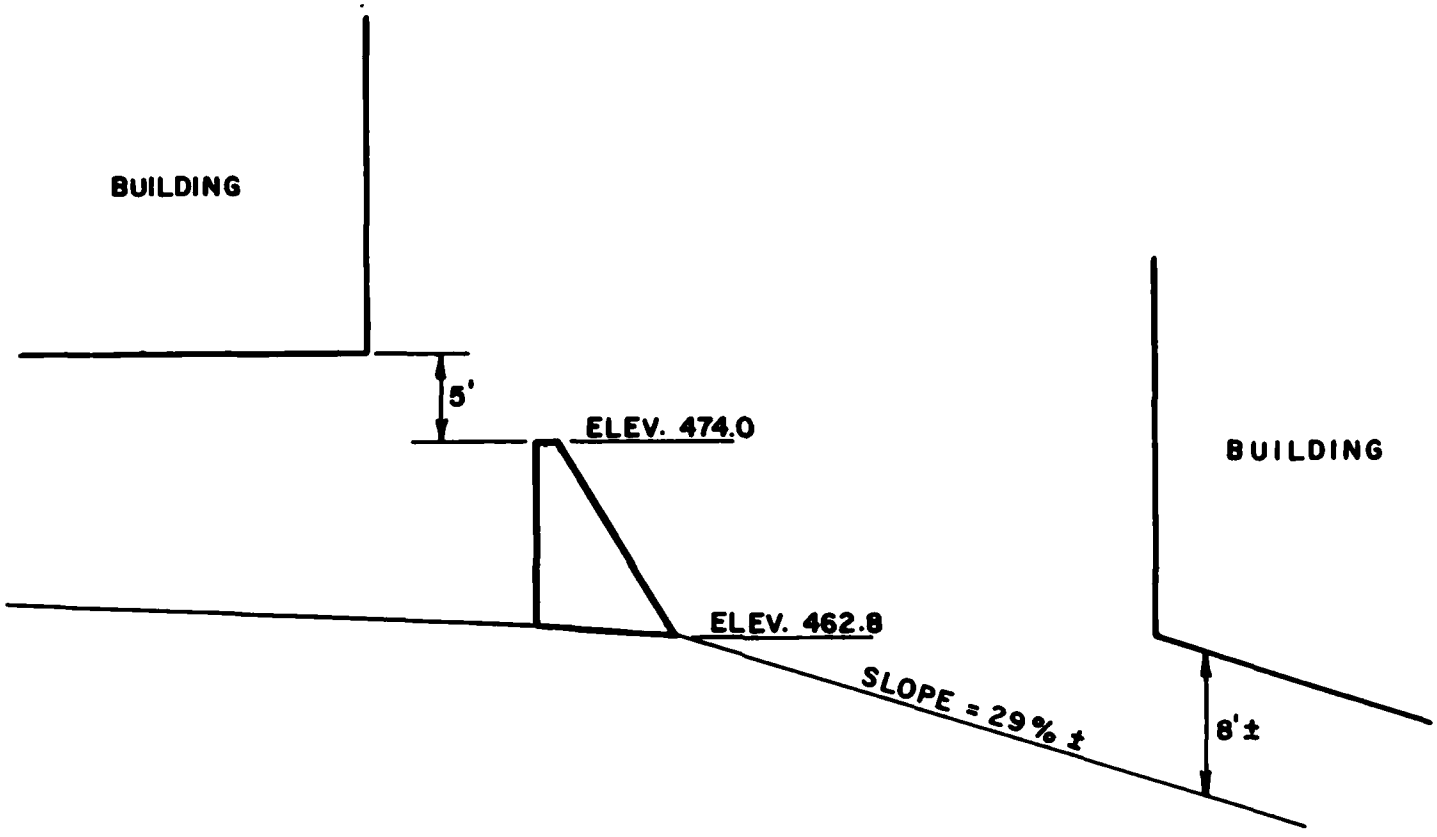


SECTION A-A

NOTE: OUTLET WORKS DETAILS UNKNOWN

PLATE B-2

PAPER MILL POND DAM
SCALE: 1"= 5'



SECTION B-B

PLATE B-3

PAPER MILL POND DAM
SCALE: 1"=10'

GT 621

6

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

Name of Dam or Pond [illegible]

Code No. HK19.8 — LONG 72-26.5

Location of Structure:

Town [illegible] — LAT 41-52.0

Name of Stream [illegible]

U.S.G.S. Quad. [illegible]

Owner Ameerbelle Corp.

Address 104 E. Main St. Rockville, 06066

875-3325

DA - 17.1

Pond Used For R

Dimensions of Pond: Width ______ Length ______ Area 8.0 A

Total Length of Dam 2 - 137' Length of Spillway [illegible]

Depth of Water Below Spillway Level (Downstream) [illegible]

Height of Abutments Above Spillway [illegible] 5-6'

Type of Spillway Construction [illegible]

Type of Dike Construction [illegible]

Downstream Conditions [illegible]

Summary of File Data [illegible] #3 in letter report of [illegible] chi dated June [illegible], 19[illegible] in [illegible] folder.

Remarks [illegible]

1700?

APPENDIX C

PHOTOGRAPHS

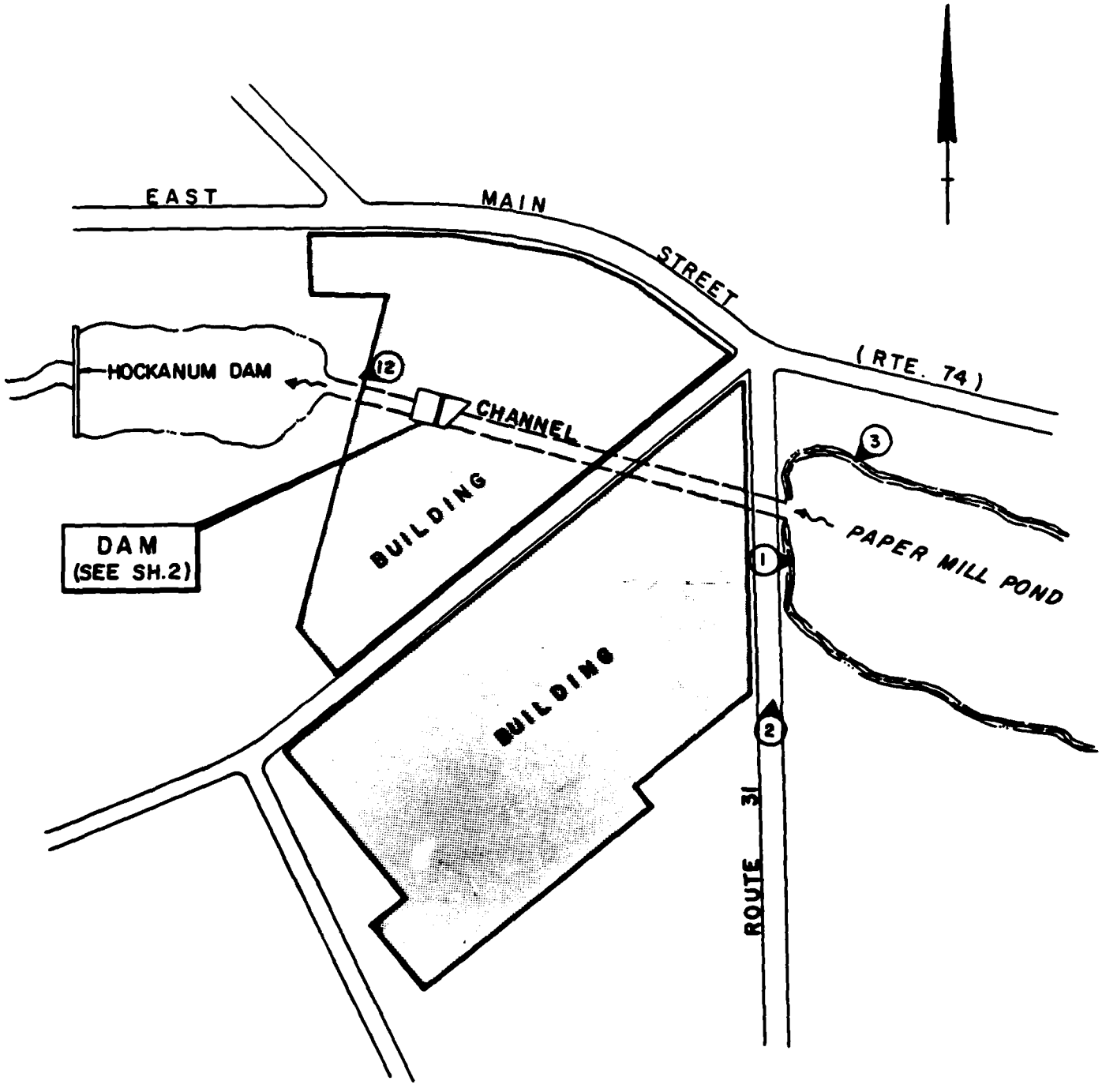


PHOTO INDEX

NOT TO SCALE

PAPER MILL POND DAM

SHEET 1 of 2

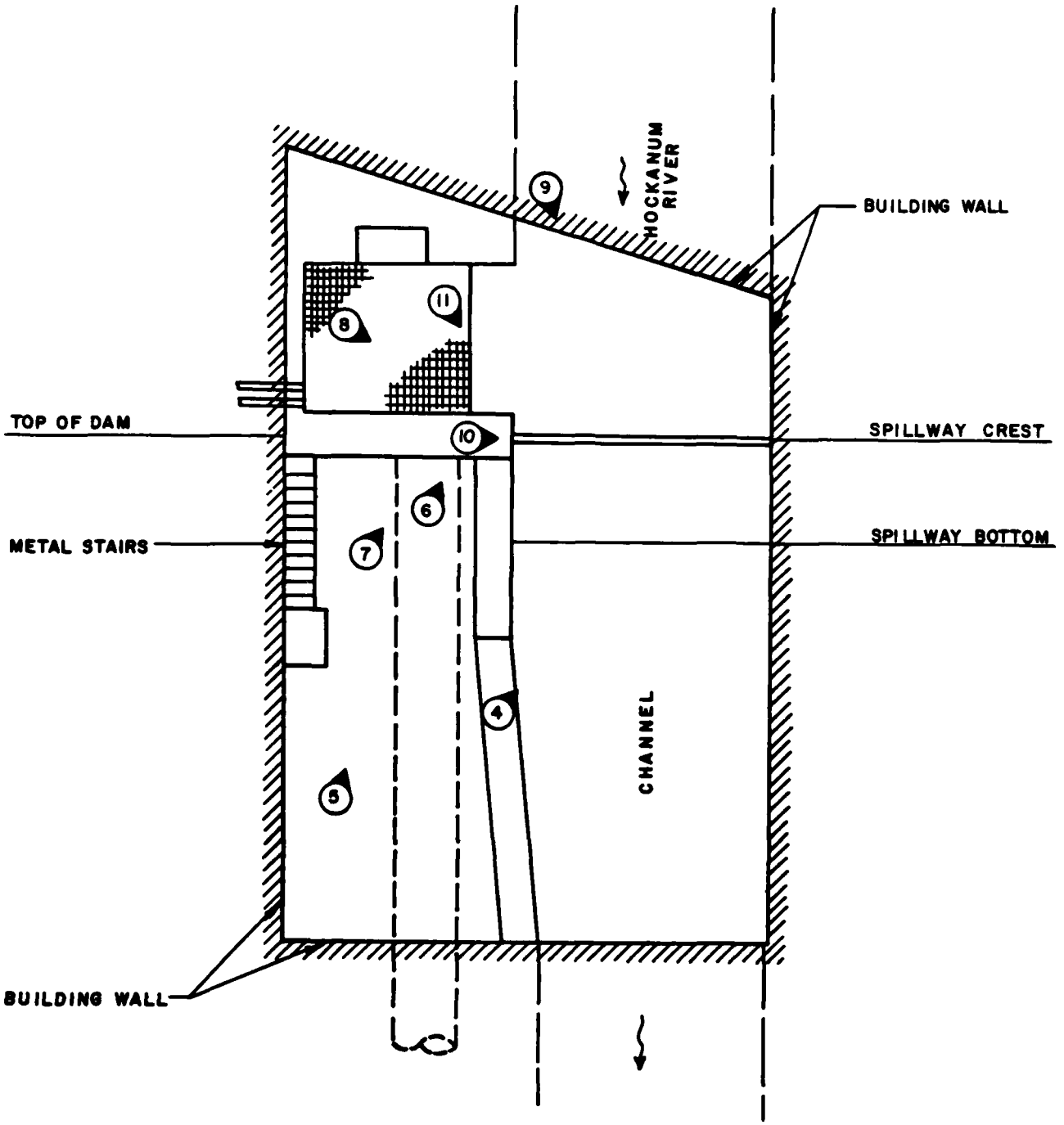


PHOTO INDEX

SCALE: 1" = 10'

PAPER MILL POND DAM

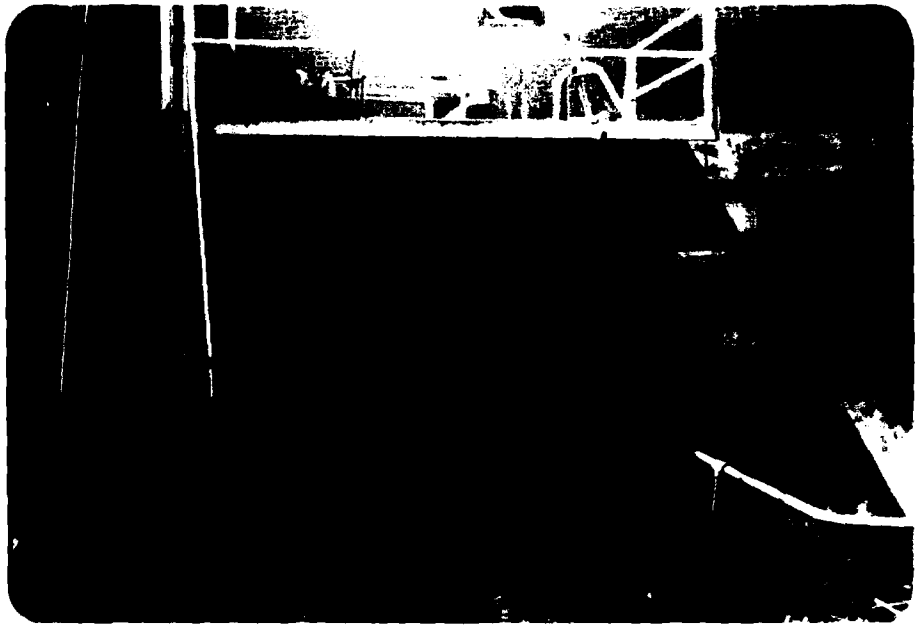
SHEET 2 of 2

C-1 UPSTREAM POND

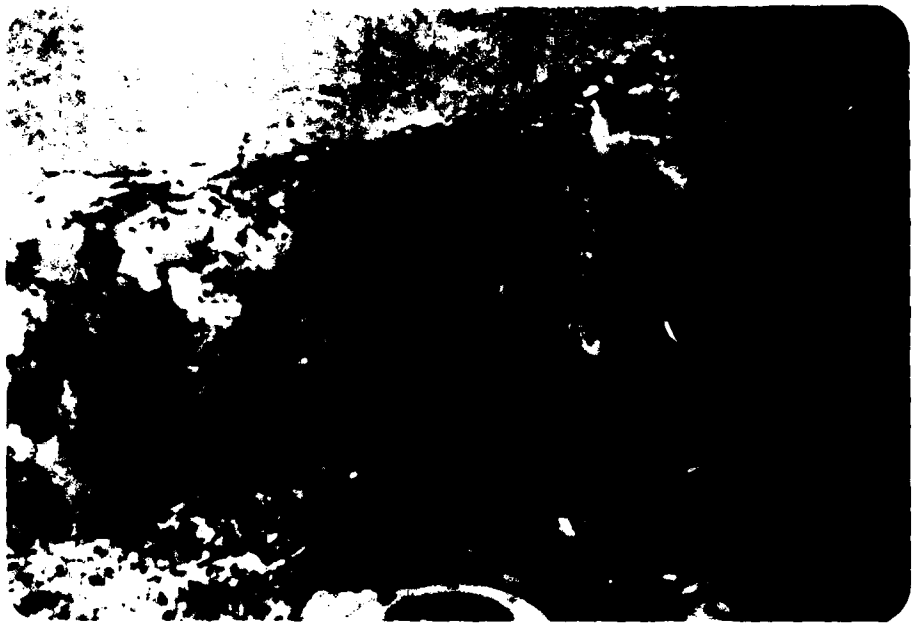
C-2 STREET OVER APPROACH CHANNEL

C-3 APPROACH CHANNEL UNDER STREET

C-4 APPROACH CHANNEL AT DAM

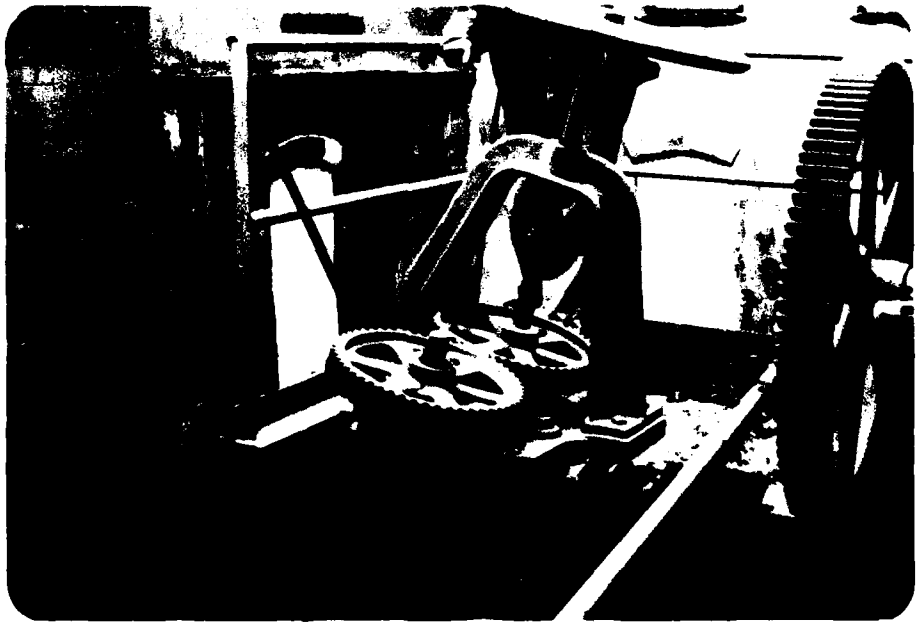


C-5 DOWNSTREAM FACE OF DAM



C-6 SEEPAGE FROM DAM

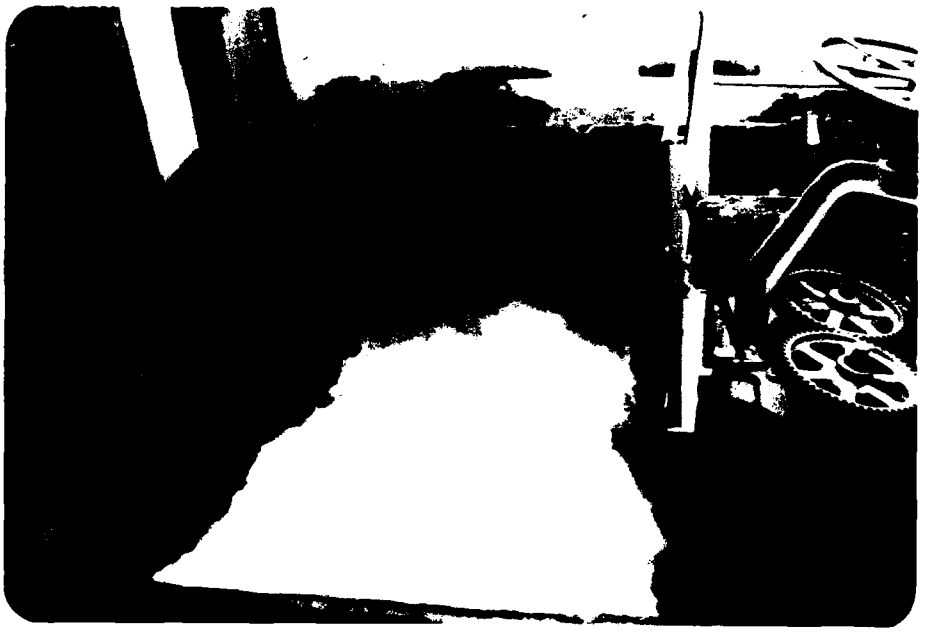
C-7 UNUSED PENSTOCK



C-8 OUTLET CONTROLS

C-9 SPILLWAY LOOKING DOWNSTREAM

C-10 SOUTH SPILLWAY ABUTMENT

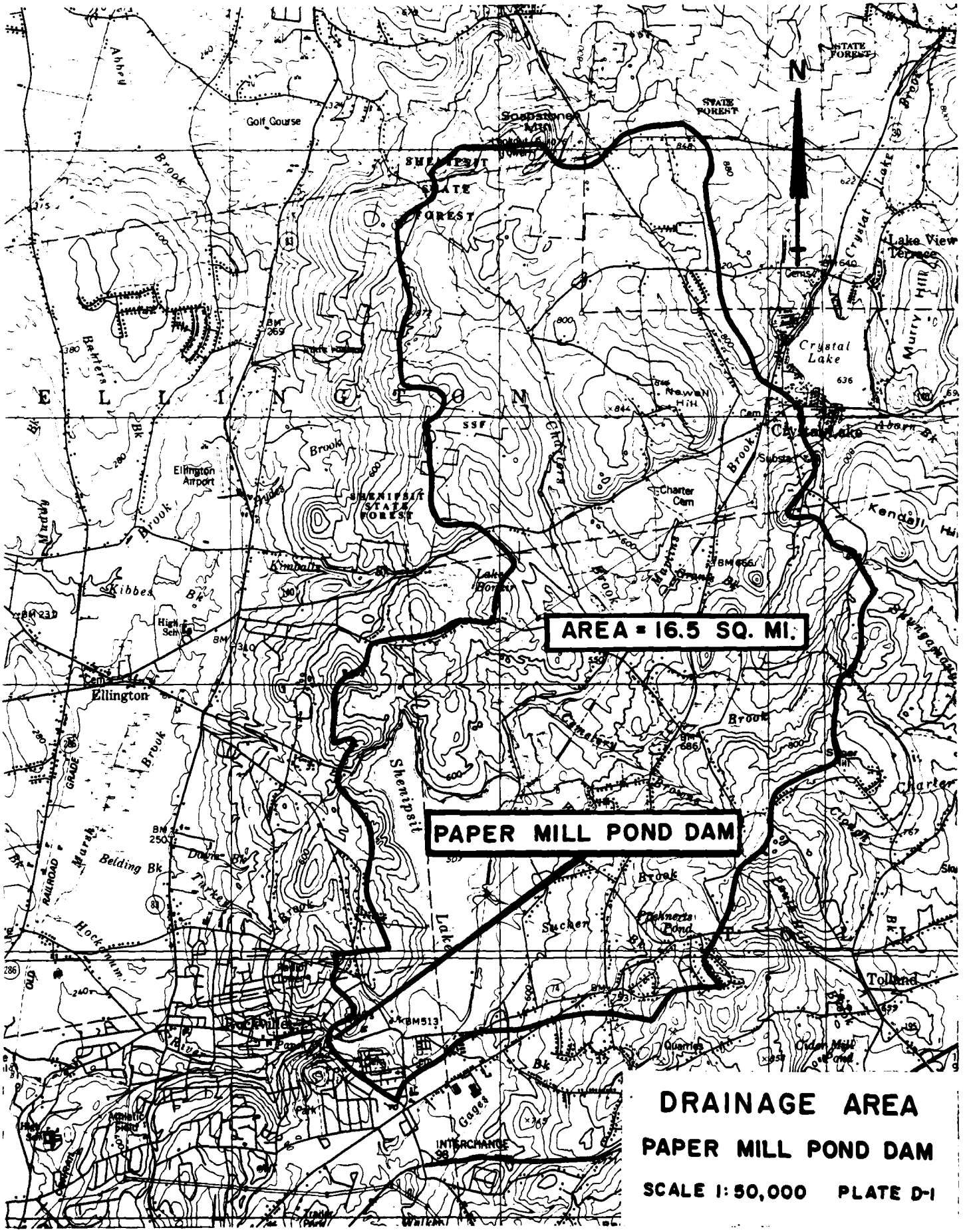


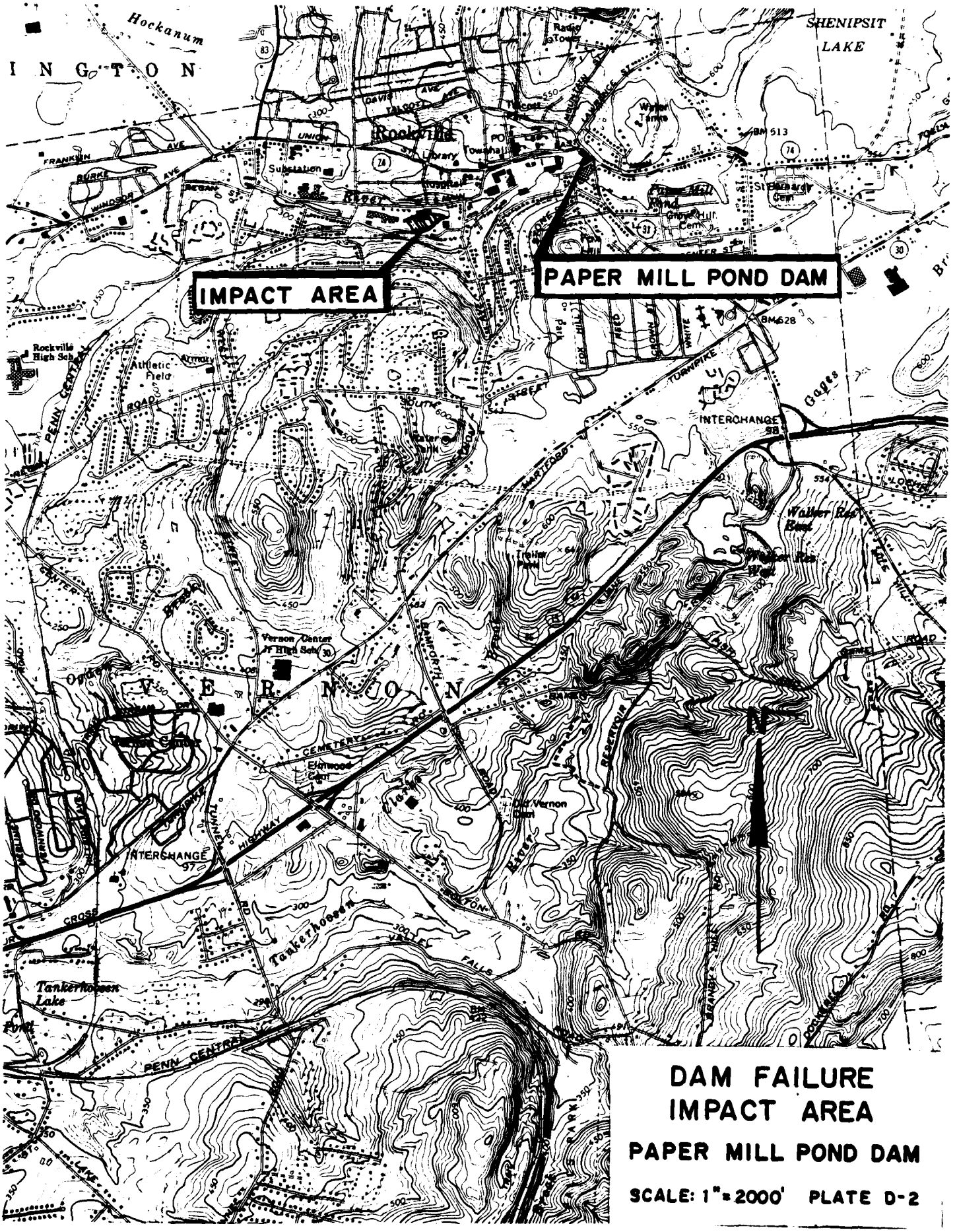
C-11 DISCHARGE CHANNEL AT SPILLWAY

C-12 DOWNSTREAM CHANNEL BELOW BUILDING

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


AREA = 16.5 SQ. MI.
PAPER MILL POND DAM
N
ELLINGTON
Golf Course
STATE FOREST
SHENIPSIT STATE FOREST
Soapstone Mtn
Crystal Lake
Lake View Terrace
Ellington Airport
Ellington
Rockville
Tolland
Shenipsit
Belding Bk.
Hockanum
Sucken Bk.
Kibbes Bk.
Kendall Hill
Charter Oak
INTERCHANGE 98
DRAINAGE AREA
PAPER MILL POND DAM
SCALE 1: 50,000 PLATE D-1



DAM FAILURE IMPACT AREA

PAPER MILL POND DAM

SCALE: 1" = 2000' PLATE D-2

FUSS&O'NEILL consulting engineers	PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
	GJM	7/8/81			80-157

SUBJECT: Hydrologic & Hydraulic Compatations – Paper Mill Pond | SHEET NO. 1 of 7

Storage Volume

Pond Area = 8.0 Ac. at spillway level
= 10.0 Ac. at Top of Dam Elevation

Maximum Depth = 16.7'

Ave. Depth = 5.0' @ Spillway Level 5.0 x 8 Ac = 40 Ac.Ft
Above Spillway Level 5.5 x 9 Ac = 50
Total Storage = 90 Ac.Ft.

Height of Dam = 16.7'

Size Classification = Small

Dam Failure Flow

W_b - Assume entire spillway width fails

$W_b = 17'$

$Y_o = 16.7'$

$Q_{P1} = 8/27\ W_b \sqrt{g}\ Y_o^{3/2}$

$= 8/27 \times 17 \sqrt{32.2} \times 16.7^{3/2}$

$= 2000$ cfs

Base Flow at Top of Dam Water Elevation

$Q = C L H^{3/2}$

$C = 3.3$
$L = 17'$
$H = 5.5'$

$Q = 700$ cfs

FUSS&O'NEILL consulting engineers	PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
	GJM	7/5/			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Paper Mill Pond | SHEET NO. 2 of 7

Assume full flow passes through Hockanum River Dam 10' downstream and into box culvert passing under buildings and shopping center.

Box culvert 14' wide and 10' high with 3.7% slope

Stage / Discharge in Box Culvert

Depth	Discharge
2'	700 cfs
5'	2700 cfs
10'	6900 cfs

Base Flow Depth = 2.0' (700 cfs)

With Failure Flow, Depth = 4.0' (2000 cfs)

At end of Box Culvert, Station 18+0

Q_{P1} = 2000 cfs

Stage = 345.6

Area = 136 S.F.

Vol. = 6 Ac.Ft.

Q_{P2} Trial: $2000\left(1-\frac{6}{90}\right)$ = 1870 cfs

Stage = 345.5

Area: 130 S.F.

Vol.: 5 Ac.Ft.

$Q_{P2} = 2000\left(1-\frac{5}{90}\right)$ = 1890 cfs

Stage = 345.5 Base Flow Stage: 343.0

Depth = 5.5' Base Flow Depth = 3.0'

Station 2+40

Q_{P2} = 1890 cfs

Stage = 297.0

Area = 210 S.F.

Vol. = 5 Ac.Ft.

Q_{P3} Trial = $1890\left(1-\frac{5}{90}\right)$ = 1790 cfs

Stage = 294.7

Area = 1985.F.

Vol. = 5 Ac.Ft.

Q_{P3} = 1790 cfs

Stage = 294.5 Base Flow Stage = 291.3

Depth = 7.5' Base Flow Depth = 4.3'

At this point, several apartments will be flooded with several feet of water which will justify a hazard classification of HIGH. Therefore, no further routing is necessary.

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	7/8/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Penn Mill Pond

SHEET NO. 4 of 7

Downstream Stage / Discharge Tables

STATION	SLOPE	n	ELEVATION	AREA	Q
18+0	3.0%	.050	340	0	0
			342	40 sq ft	300 cfs
			345	115 sq ft	1500 cfs
			350	280 sq ft	5500 cfs
29+0	1.7%	.050	287	0	0
			290	60 sq ft	400 cfs
			293	120 sq ft	1100 cfs
			295	210 sq ft	1900 cfs
			298	370 sq ft	3900 cfs

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	7/31/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Paper Mill Pond

SHEET NO. 5 of 7

TEST FLOOD

Size Classification - Small

Hazard Classification - High

Test Flood - 1/2 PMF to PMF

Because of small dam length and height and flow restrictions due to building over channel, Use 1/2 PMF

Hockanum River Dam (No. CT00620) is located immediately downstream of Paper Mill Pond Dam (300'±). The Phase I Inspection Report for this dam dated May 1980 used a 1/2 P.M.F Test Flood of 5,100 cfs. Since the drainage areas of the two dams are virtually the same, use 5100 cfs as the Test Flood.

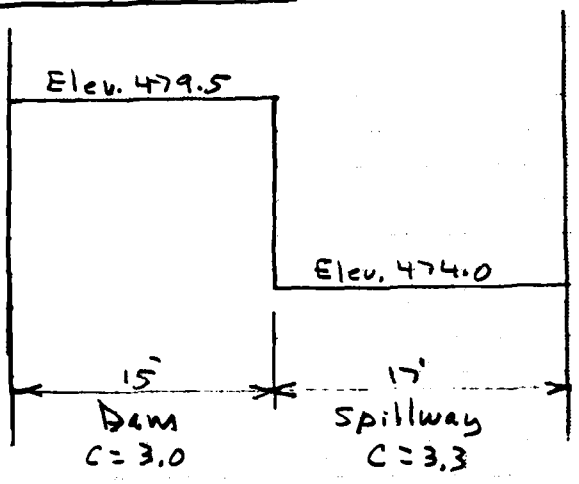
FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	7/9/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Paper Mill Pond

SHEET NO. 6 of 7

Spillway Capacity



$Q = C L H^{3/2}$

Elev.	Capacity - Spillway	Capacity - Dam	Total Capacity
474.0	0	0	0
477.0	290 cfs	0	290 cfs
479.5	700	0	700
482.0	1270	180 cfs	1450
484.0	1770	430	2200
486.0	2330	750	3080
488.0	2940	1120	4060
490.0	3590	1530	5120

Based on no submergence from downstream channel

FUSS&O'NEILL consulting engineers	PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
	JM	7/9/71			20-157

SUBJECT: Hydrology & Hydraulic Computations — Papa Mill Pond

SHEET NO. 7 of 7

Effect of Surcharge Storage on Discharge

Q_{P_1} = 5100 cfs

Surcharge Height to pass Q_{P_1} = 490.0 (16.0')

Volume of Surcharge = $STOR_1$ = 10 Ac. x 16 = 160 Ac-Ft

Drainage Area = 16.5 sq. mi. = 10,560 Ac.

(160 ÷ 10,560) x 12 = .2" Runoff

½ PMF Runoff = 9.5"

$Q_{P_2} = 5100\left(1 - \frac{.2}{9.5}\right) = 5000$ cfs = Test Flood Discharge

Stage at Test Flood Discharge = 489.8

Surcharge = 10 Ac x 15.8' = 158 Ac.-Ft.

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME